

CLAIMS

What is claimed is:

1. A tool for removing at least one tissue plug from the wall of at least one tubular tissue structure, comprising:
 - a cutter;
 - a piercing member positioned within said cutter, wherein said piercing member and said cutter are configured to translate together; and
 - an impulse source operationally connected to said cutter and said piercing member.
2. The tool of claim 1, wherein said piercing member is a needle.
3. The tool of claim 1, wherein said piercing member is at least partially hollow.
4. The tool of claim 1, wherein said piercing member is fluted.
5. The tool of claim 1, wherein said piercing member includes a spike at its distal end.
6. The tool of claim 1, further comprising at least one capture feature defined in said cutter.
7. The tool of claim 1, wherein said impulse source is a torsion spring.
8. The tool of claim 1, wherein said impulse source is configured to store energy.

9. The tool of claim 1, further comprising an actuator operationally connected to said impulse source.
10. The tool of claim 1, further comprising a header connected to the proximal end of said piercing member and said cutter.
11. The tool of claim 10, wherein said impulse source is connected to said header.
12. The tool of claim 11, wherein said header is configured to rotate and move distally upon application of an impulse from said impulse source.
13. The tool of claim 12, wherein said impulse source is a torsion spring, and wherein said torsion spring increases in length upon application of said impulse.
14. The tool of claim 10, wherein said header includes at least one thread defined therein.
15. The tool of claim 14, further comprising a body having an inner surface in which at least one thread is defined, said thread corresponding to said thread defined in said header.
16. The tool of claim 15, wherein the pitch of said threads is substantially 24 threads per inch.
17. The tool of claim 10, further comprising an actuator movably connected to said

body and engageable with said header.

18. The tool of claim 17, wherein said actuator is configured to rotate about an axis perpendicular to the longitudinal axis of said cutter.

19. The tool of claim 17, wherein said actuator comprises a trigger connected to a restraint, wherein said restraint is selectively engageable with said header.

20. The tool of claim 19, wherein said header includes an engagement feature configured to receive said restraint.

21. The tool of claim 10, wherein said cutter and said piercing member are movable between a pre-firing position and a post-firing position.

22. The tool of claim 21, wherein said cutter has a length sufficient to retain a plurality of tissue plugs.

23. The tool of claim 21, further comprising a reload shaft detachably connected to said header.

24. The tool of claim 23, wherein the longitudinal centerline of said reload shaft is substantially coincident with the longitudinal centerline of said header.

25. The tool of claim 23, further comprising a post extending from the distal end of said reload shaft, wherein said header includes a receiver configured to selectively

engage said post.

26. The tool of claim 25, wherein said post is substantially coaxial with the longitudinal centerline of said reload shaft.

27. The tool of claim 25, wherein said post is substantially parallel to and offset from the longitudinal centerline of said reload shaft.

28. The tool of claim 25, wherein said post has a polygonal cross-section.

29. The tool of claim 26, wherein rotation of said reload shaft causes said header to move proximally, when said post is in engagement with said receiver.

30. The tool of claim 29, wherein proximal motion of said header imparts energy to said impulse source.

31. The tool of claim 26, wherein said impulse source is a torsion spring, and wherein said torsion spring decreases in length upon rotation of said reload shaft.

32. The tool of claim 23, further comprising a knob connected to the proximal end of said reload shaft.

33. The tool of claim 1, wherein said cutter and said piercing member are substantially coaxial.

34. A method for making an opening in the intact wall of an aorta, comprising:
- providing a cutter and a piercing member positioned within said cutter;
 - wherein said piercing member and said cutter are configured to translate together;
 - advancing said cutter and said piercing member at a speed between substantially 0.8 meters per second and substantially 1.4 meters per second; and
 - rotating said cutter.
35. The method of claim 34, wherein said advancing is impulsive.
36. The method of claim 34, wherein said advancing occurs for a duration less than one second.
37. A method for making an incision in and removing tissue from a vessel wall, comprising:
- providing a cutter and a piercing member positioned within said cutter,
 - movable between a pre-firing state and a post-firing state;
 - placing said cutter and said piercing member in proximity to the vessel;
 - imparting an impulse to said cutter and said piercing member when in said pre-firing state; and
 - converting said impulse to rotary motion and to translational motion through the vessel wall.
38. The method of claim 37, further comprising moving said cutter and said piercing

member from said post-firing state to said pre-firing state.

39. The method of claim 37, wherein the duration of said impulse is less than one second.

40. The method of claim 37, wherein fluid is present within the vessel, and wherein said impulse is exerted over a time short enough such that the fluid within the vessel behaves as an incompressible fluid upon contact between said cutter and the vessel wall.

41. The method of claim 37, wherein said impulse source is a torsion spring, wherein said imparting further comprises winding said torsion spring as said cutter and said piercing member move from said pre-firing state to said post-firing state.

42. The method of claim 37, wherein said impulse source is a torsion spring, wherein said imparting further comprises unwinding said torsion spring as said cutter and said piercing member move from said post-firing state to said pre-firing state.